Heat Flow in the Ocean-Continent Crustal Transition Zone of the Eastern Gulf of Mexico

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ABSTRACT

Characterization of the igneous basement of the ocean-continent transition zone is important in reconstructing the early opening history of sedimentary basins in continental margins. The transition zone is usually buried under a thick sediment cover, which makes it difficult to study the basement geology by conventional seismic techniques or drilling. Previous studies have proposed using heat flow observations to locate the ocean-continent crustal boundary in such areas. Because continental basement rocks produce more radiogenic heat than oceanic basement rocks, the crustal transition zone may be located by closely spaced, marine heat flow measurements in the transition zone. We test such a possibility in the eastern margin of the Gulf of Mexico, using ~160 seafloor heat flow measurements. Across a narrow zone along the eastern Gulf of Mexico margin, the seafloor heat flow values increase from ~20 mW/m² to ~40 mW/m² landward. This zone coincides with the ocean-continent crustal boundary proposed by recent seismic studies. Numerical models of the heat transport through the lithosphere and overlying sediments have been generated, and they show that heat flow through the basement of the continental side should be greater as expected by the higher seafloor heat flow values observed there. We therefore argue that seafloor heat flow measurements may be used for delineating the ocean-continental crustal boundary in the eastern Gulf of Mexico.

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